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I. INTRODUCTION AND PROGRAM BACKGROUND

I.A Introduction

The South Florida Water Management District's (SFWMD) Vegetation Management Program is responsible for managing nuisance vegetation in 16 counties in central and southern Florida, an area of 15,673 square miles. The District manages exotic invasive aquatic and terrestrial plants in more than 1,800 miles of canals and levees, 500,000 surface acres of public lakes, over 850,000 acres of Everglades Water Conservation Areas and on 250,000 acres of public conservation lands. Additionally, the District cooperates with other land management agencies within the District's boundary in support of regional vegetation management goals. Ad valorem taxes, mitigation funds, Water Management Lands Trust Fund, and a cooperative funding agreement with Florida's Department of Environmental Protection (DEP) provide the cost of managing this vegetation.

Vegetation control operations are conducted by staff in the Operations and Maintenance Department (OMD) located at the District's seven regional field stations and Big Cypress Basin and through contracts administered by program staff in the main headquarters office in West Palm Beach. Contractual support is used to augment field station activities during

seasons of peak weed growth (late summer) and to remove hazardous trees along canal rights-of-way. Nearly all of the vegetation management work conducted in the Everglades, Stormwater Treatment Areas, Lake Okeechobee and on District managed conservation lands is outsourced through the Vegetation Management Division.

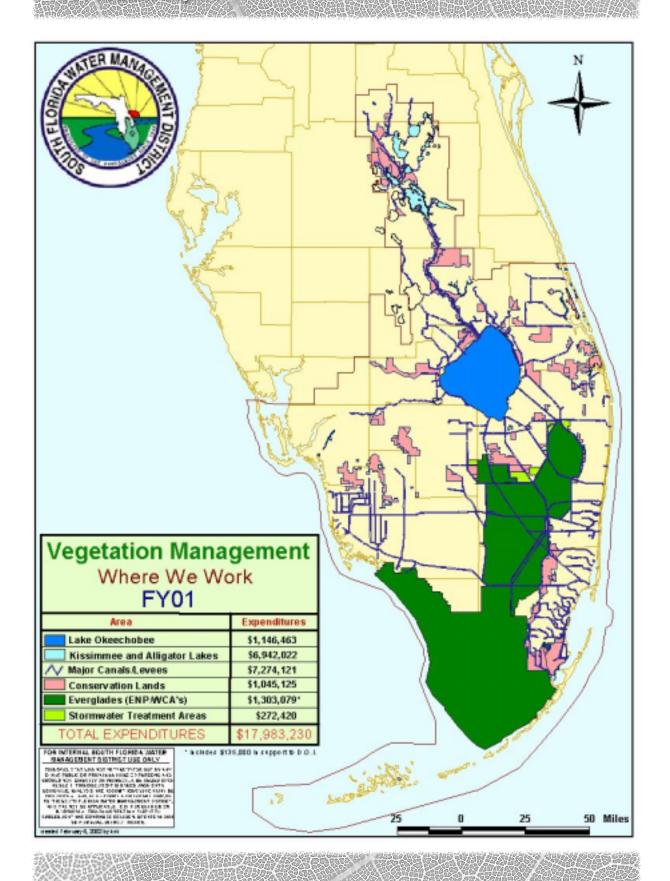
The implementation of a vegetation management program is necessary to ensure the continued use and function of the region's water resources. The sub-tropical climate along with an almost year-round growing season helps create the lush vegetative communities populating the water resources of central and south Florida. Other factors include

What is an invasive exotic plant and why are they bad for the environment?

The Florida Exotic Pest Plant Council (FLEPPC) defines an invasive exotic plant as -- a species introduced to Florida, purposefully or accidentally, from a natural range outside of Florida, that not only has naturalized but is expanding on its own in Florida plant communities. Invasive exotic plants cause substantial economic losses, a reduction in agricultural production, and significant direct control costs. Billions of dollars are lost each year in the United States from these plant pests. Millions of acres of natural areas are infested with exotic plants with a concomitant loss of native species. Hundreds of rare and endangered species and rare habitats are jeopardized by the unchecked spread of these alien invaders.

The FLEPPC maintains and updates an invasive plant list that can be viewed at <u>www.fleppc.org</u>.

naturally eutrophic waters related to the underlying geology of Florida, lake stabilization, increased run-off of nutrients from a myriad of human related activities, and the constant introduction of exotic species into the area.



Aquatic and terrestrial plant management:

- keeps navigation channels open
- keeps drainage and flood water systems operating at design capacity
- keeps water control structures and pumping facilities unobstructed
- enhances fish and wildlife habitats
- reduces mosquito breeding areas
- protects native plant communities
- enhances recreational activities

The goal the Vegetation Management Program is the maintenance control of nuisance vegetation throughout the District an integrated strategy. through Florida Statute, Chapter 369.22 defines a maintenance program as, "a method for managing exotic aquatic plants in which control techniques utilized are in coordinated manner on a continuous basis in order to maintain plant populations at the lowest feasible level." Maintenance control results in the use of less herbicide, the

Why does it cost so much more per acre to manage invasive plants in south Florida when compared to other regions of the state?

Simply stated, the invasive plant problem is much worse in south Florida. The number of species that have escaped into the wilds is greater, and the range of their expansion is greater. No other region of the continental United States has experienced invasion from exotic pest-plants to the extent south Florida has experienced. Many reasons have been put forth that may help to explain this. The most obvious reason has to do with south Florida's sub-tropical environment. This milder climate has allowed a much greater number of introduced plant species to survive here. Especially tropical species. Studies have shown that the larger the number of introduced species, and the longer they have been established in their new range, the greater the likelihood that they will invade. At present, more than 30% of the plants living and reproducing in the wilds of south Florida are foreign. The problem existed for decades before programs were established to mitigate the threat. As a result, the costs to manage them is comparatively high. This reality is not likely to change anytime soon. New plant species are still being introduced to the state, and development pressure in the region continues to put these introduced plants closer to our prized natural areas, like the Everglades. Ornamental plantings of exotic species in our landscapes are jumping off points for invasion. As long as we continue to allow unabated plant introductions, we will continue to introduce new threats.

deposition of less organic matter (from the decomposition of dead leaves and other plant parts) on the bottom of the waterbody, less overall environmental impact by weeds, and reduced management costs.

PROGRAM OBJECTIVES:

1. To provide vegetation management services for all District divisions and other cooperating public agencies within the SFWMD boundary.

- 2. To promote the implementation of a maintenance control program for targeted species.
- 3. To improve the operation of the water conveyance system through integrated pest management techniques.
- 4. To enhance and conserve the natural ecosystems through elimination of invasive exotic plants.
- 5. To incorporate the latest weed management technologies.
- 6. To encourage interagency cooperation.
- 7. To keep the general public and user groups informed about the program.
- 8. To provide coordination, technical direction and training of personnel, monitoring, evaluation, and review of program activities.

I.B Crisis Management -vs- Maintenance Control

Crisis management needs little explanation; a crisis is observed and immediately manpower, resources and funding are directed to averting disaster. Crisis management is neither preventative nor proactive; it is a reaction. While this reaction is often necessary

maintenance and unavoidable. control of exotic invasive vegetation is a more cost-effective long-term approach to management. Maintenance control means that plant managers maintain the plants at a low level, and keep them at a herbicides, low level using machines and biological control agents such as insects and fish. A example effective good of maintenance control in Florida is the control of waterhyacinth in state

What is Maintenance Control?

Florida law (F.S. 372.925) defines "maintenance control" as "a method of managing exotic plants in which control techniques are utilized in a coordinated manner on a continuous basis in order to maintain a plant population at the lowest feasible level." Maintenance control results in the use of less herbicides, less organic deposition in aquatic environments, less overall environmental impacts from the weeds and their management, and reduced management costs.

waters. This state program, which the District participates in, is widely known as a success story. If only a year passed without constant vigilance by management agencies, waterhyacinth would likely return to infestation levels that would require millions of dollars worth of effort to return to maintenance levels. Increased costs and adverse environmental impacts result when maintenance control activities lapse and then resume years later, allowing invasive exotic plant populations to significantly expand in the interim.

Hyacinth Acres Acres Controlled Tons of Organics Pounds of 2,4-D 74 76 78 80 82 84 86 88 90 92 94 96 98

Waterhyacinth Maintenance Control, Suwannee River, 1974-1999

Waterhyacinth covered 2,300 acres of the Suwannee River in the early1970s. Thousands of tons of sediments accumulated from live plants that shed root and shoot material and also from control management efforts. In addition, hundreds of acres of waterhyacinth required control using thousands of pounds of herbicide each year. Because of this, maintenance control replaced crisis management in the late 1970s reducing environmental and economic impacts. Native plants have returned to the shores and marshes of the Suwannee River, restoring fish and wildlife habitat.

I.C Legislation

MANAGEMENT AUTHORITY

There are a number of statutes and rules that govern the activities of those conducting vegetation management programs in Florida, the most pertinent of these are summarized here:

DISTRICT:

Developed from the maintenance considerations of the Flood Control Act of 1948, House Document 643, 80th Congress, 2nd Session and Chapters 25270 and 378 F.S.,

1949, which provide for maintenance of project works necessary for flood protection and water supply.

STATE:

Chapter 212.69 F.S., Distribution of Proceeds. The Department of Environmental Protection (DEP) shall be transferred \$3.8 million per year in equal monthly amounts from the Gas Tax Collection Trust Fund, which shall be used for eradication or control and research of waterhyacinth and noxious aquatic vegetation. One million dollars shall be spent solely for non-chemical control of aquatic weeds, research into non-chemicals, and enforcement of aquatic weed control programs.

Chapter 327.28 F.S., Aquatic Plant Control Trust Fund (Motor Boat Revolving Trust Fund; appropriation and distribution). Two dollars from each non-commercial vessel registration fee, except for Class A-1 motorboats, shall be transferred to the Aquatic Plant Control Trust Fund for aquatic weed research and control. Forty percent of the registration fees from commercial vessels shall be transferred to the Aquatic Plant Control Trust Fund for aquatic plant research and control.

Chapter 369.20 F.S., Florida Aquatic Weed Control Act. The DEP will direct the control, eradication, and regulation of noxious aquatic weeds and the research and planning related to these activities. They will guide and coordinate the activities of all public bodies, authorities, agencies and special districts charged with the control or eradication of aquatic weeds and plants; promote, develop, and support research activities directed toward the more effective and efficient control of aquatic plants; and disburse funds to any special district or other local authority charged with the responsibility of controlling or eradicating aquatic plants, under certain conditions.

Chapter 369.22 F.S., Nonindigenous Aquatic Plant Control. Delegates the responsibility of supervising, directing, guiding, reviewing, approving, coordinating, and disbursing of funds for the control of nonindigenous aquatic plants, excluding the authority to use fish as a biological control agent. Defines terms relating to nonindigenous aquatic plant control and designates areas of state and local responsibilities (e.g. intercounty waters [state] and intracounty waters [local]). Annual status report of the nonindigenous aquatic plant maintenance programs in intercounty waters will be provided by January 1st to the Governor and Cabinet. Authorizes the DEP to enter into cooperative agreements with the United States and delegate authority to the Florida Fish and Wildlife Conservation Commission (FWC) as necessary.

Chapter 369.25 F.S., Aquatic Plants; Permits; Penalties. Requires a person engaging in the business of importation, transportation, cultivation, collection, sale, or possession of any aquatic plant species to obtain a permit or exemption from the DEP. No person shall import, transport, cultivate, collect, sell, or possess any noxious aquatic plant listed on the prohibited aquatic plant list established by the Department without a permit or exemption

issued by the Department. This act provides the Department certain powers. These include: 1) to make rules governing the importation, transportation, cultivation, collection, and possession of aquatic plants; 2) establish by rule lists of aquatic plant species regulated in coordination with the Department of Agriculture and Consumer Services (FDACS) and the FWC; 3) evaluate aquatic plant species through research; 4) declare quarantine; 5) make rules governing the application process; 6) enter into cooperative agreements with any person to carry out this act; 7) purchase all necessary supplies, material and equipment necessary; 8) enter upon and inspect any aquatic plant facility to determine compliance with this section and Department regulations and to seize and destroy, without compensation, any aquatic plants held in violation of these provisions; and 9) to conduct a public information program. Violations of the provisions of this act are punishable as a second-degree misdemeanor.

Chapter 369.251 F.S., Invasive nonnative plants; prohibitions; study; removal; rules. Prohibits the selling, transporting, collecting, cultivating, or possessing any plant, including any part or seed, of the species *Melaleuca quinquenervia*, *Schinus terebinthifolius*, *Casuarina equisetifolia*, *Casuarina glauca*, or *Mimosa pigra* without a permit from DEP. Also directs DEP to study methods of control of these plants as well as to adopt rules to implement this section. This statute specifically directs the South Florida Water Management District to undertake programs to remove such plants from Water Conservation Areas 1, 2 and 3.

Chapter 369.252 F.S., Invasive exotic plant control on public lands. Directs DEP to establish a program to: (1) Achieve eradication or maintenance control of invasive exotic plants on public lands; (2) Assist state and local government agencies in the development and implementation of coordinated management plans for the eradication or maintenance control of invasive exotic plant species on public lands; (3) Contract, or enter into agreements, with entities in the State University System or other governmental or private sector entities for research concerning biological control agents; and development of workable methods for the eradication or maintenance control of invasive exotic plants on public lands; (4) Use funds in the Invasive Plant Control Trust Fund for carrying out activities on public lands. Twenty percent of the funds shall be used for the purpose of controlling nonnative, upland, invasive plant species on public lands.

Chapter 370.021 F.S., Administration; Rules, Publications, Records; Penalty for Violation of Chapter; Injunctions. Ensures that the DEP shall make, adopt, promulgate, amend and repeal all rules and regulations necessary or convenient for the carrying out of the duties, obligations, powers, and responsibilities conferred on the Department or any of its divisions.

Chapter 403.088 F.S., Water Pollution Operation Permits; Temporary Permits; Conditions. This act directs the DEP to establish the procedures for programs to issue

permits for aquatic plant control activities as they may affect water quality in waters of the state.

Chapter 403.141 F.S., Civil Liability: Joint and Several Liability. A violator would be required to restore the natural resources to its former condition and would be subject to the judicial imposition of a civil penalty up to \$10,000 per offense. Each violator shall be jointly and severally liable for such damage and for the reasonable cost and expenses incurred by the state. A table of values for individual categories of fish is determined by the DEP and the FWC to be utilized in the assessment of damages for fish killed. This act also provides for exemption of damages for fish kills caused by approved aquatic plant control. The laws of Chapter 403 pertain to Chapter 17-3 and -4, F.A.C.

Chapter 403.161 F.S., Prohibitions, Violations, Penalty, Intent. Provides for civil and criminal penalties and fines for any violation of Chapter 403. A fine of \$2,500 or no more than \$25,000 or one year in jail, or both is provided for each offense. Violations discovered under the rules of Chapter 62C-20, F.A.C., are reported to the DEP for processing.

FEDERAL:

Rivers and Harbors Act of 1899, Section 10, 33 U.S.C. Section 403 (1986); Flood Control Act of 1944, Section 2, 33 U.S.C.A. Section 701a-1 (Supp. 1988); Flood Control Act of 1944, Section 4, 58 Stat. 889 (codified as amended at 16 U.S.C., Section 460d (1974 and Supp. 1988)); Forest Cover Act, Sections 1 and 2, of 1960, 16 U.S.C., sections 580m-n (1985); Fish and Wildlife Coordination Act, Section 2, of 1958, 72 Stat. 5639 (codified as amended at 16 U.S.C., Sections 661-664, 1985 and Supp. 1988); and 31 U.S.C., Section 6305 (1983). These acts provide the United States Army Corps of Engineers a congressional mandate for responsibility for funding and management of navigable waters of the Unites States. Specifically mentioned is the removal of obstructions to navigation, maintenance of waterways in the interest of flood control, maintenance and improvement of water resources development projects, and conservation of natural resources held in public trust.

PERMITTING

All vegetation management activities are permitted and governed under several Federal and State regulations. The Florida Department of Environmental Protection (DEP), Bureau of Invasive Plant Management is the lead agency for the permitting of activities as well as inspection and enforcement of regulations. The Florida Fish and Wildlife Conservation Commission (FWC) and DEP, Division of Environmental Resource Permitting, review all permit applications. This review process results in the approval, disapproval, or modification of the application activities. The Vegetation Management Division staff is responsible for the submittal of requests for permits and modifications to existing permits. A listing of the various laws and rules includes:

FEDERAL:

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Public Law 92-516 of 1972 (as amended). Provides for the federal registration of pesticides, certification of applicators, regulation of restricted use pesticides, record keeping, protection of trade secrets, unlawful acts and penalties, disposal and transportation, and administrative procedures relating to pesticides.

Noxious Weed Regulations, Part 360, 7 U.S.C. 2803 and 2809; 7 CFR 2.17, 2.51, and 371.2(c).

STATE:

Florida Pesticide Law and Rules, Chapter 487,F.S. and Chapters5E-2 and 5E-9, FAC.

Provides for the state administration of FIFRA according to a specific plan approved by the EPA, application for Special Local Needs (SLN) permits, and certification standards for applicators.

DEP Permitting Rule, Chapter 62C-20, FAC. Provides for the protection of the waters of the State from uncontrolled growth of aquatic vegetation through a program of contracts and permits. Establishes types of permits, criteria for operational programs, and penalties.

DEP Permitting Rule, Chapter 62C-52, FAC. Provides for the protection of the waters and the native aquatic and wetland vegetation communities of the state by regulating and permitting the collection, transportation, possession, cultivation, sale, and planting of selected plant types.

Florida Department of Agriculture and Consumer Services (FDACS) Rule, Rule 5B. –57.006 and 57.007. States that it is unlawful to introduce, possess, move, or release any living stage of designated prohibited plants without a permit. It also provides that FDACS shall cooperate with other appropriate parties to eradicate or control noxious weeds.

FWC Permitting Rule, 68A-23.088. Provides for the utilization of triploid grass carp in public and private waters of the State.

FUNDING

DEP Funding for Aquatic Plant Management, Chapter 62C-54, FAC. The State of Florida, and the United States Army Corps of Engineers provide funds through the Aquatic Plant Management Trust Fund to water management districts and local governments to implement maintenance programs for the management of

aquatic plants. After federal and state appropriation, the Corps and the Florida Legislature provide funds to DEP annually for this purpose. Funds are allocated by DEP to grant applicants, after evaluation of workplan and budget requests submitted for eligible waters, in accordance with eligibility standards and priorities established in this chapter. The department then monitors and assists grantees to ensure the appropriate management of aquatic plants and funds. Acceptable herbicide, mechanical and physical, and biological control management standards are described.

I.D Control Methods

Many different techniques are used to control exotic invasive plants at the south Florida Water Management District. Herbicides, biological controls, manual, mechanical and physical controls are all used separately or in conjunction to slow the spread of Following are more exotics. detailed descriptions of each of these methods.

HERBICIDES:

Herbicides are pesticides designed to kill plants. They are a vital component of most control programs and are used extensively for exotic plant species management in south Florida.

Why are these invasive plants "managed," and not eradicated?

If eradication is possible, then eradication is the goal. However, for most of our invasive plant problems eradication is not possible. By the time an introduced plant shows it's invasive potential, it is generally widespread and beyond the point of cost effective eradication. Additionally, many or our most invasive species are still legally sold in the horticulture trade. While an intensive effort could potentially eradicate a plant from public lands, privately held lands, which still harbor these plants, will continue to supply a viable seed source for reinfestation, making the eradication effort futile. Past experience has demonstrated that invasive plants can be cost effectively managed at low levels, with minimum impacts to the environments that they have invaded, once the initial populations are reduced.

HERBICIDE APPLICATION METHODS

- Foliar applications. A herbicide is diluted in water and applied to the leaves with aerial or ground based equipment. Foliar applications can either be directed, to minimize damage to non-target vegetation, or broadcast. Broadcast applications are used where damage to nontarget vegetation is minimal or where a selective herbicide is used.
- Basal bark applications. A herbicide is applied, commonly with a backpack sprayer, directly to the bark around the circumference of each stem/tree up to 15 inches above the ground. The herbicide is absorbed through the bark and translocated throughout the plant.

- Frill or girdle (sometimes called "hack-and-squirt") applications. Cuts are made into the cambium completely around the circumference of the tree or with no more than three-inch intervals between cut edges. Continuous cuts (girdle) are sometimes used for difficult-to-control species and large trees. Herbicide (concentrated or diluted) is applied to each cut until the exposed area is thoroughly wet. Frill or girdle treatments are slow and labor intensive, but sometimes necessary in mixed plant communities to kill target vegetation and minimize damage to desirable vegetation.
- Stump treatments. After cutting and removing large trees or brush, a herbicide (concentrated or diluted) is sprayed or painted onto the cut surface. The herbicide is usually concentrated on the cambium layer on large stumps, especially when using concentrated herbicide solutions. When using dilute solutions the entire stump is sometimes flooded (depending on label instructions) with herbicide solution.
- Soil applications. A granular or liquid herbicide formulation is applied by handheld spreaders, by specially designed blowers, or aerially, directly to the root zone of the targeted species. The herbicide is absorbed by the roots and translocated throughout the plant.

WHERE HERBICIDES CAN BE USED

A pesticide, or some of its uses, is classified as "restricted use" if it could cause harm to humans or to the environment unless it is applied by certified applicators who have the knowledge to use these pesticides safely and effectively. Although none of the herbicides used for invasive plant control by the District are classified as "restricted use," the basic knowledge of herbicide technology and application techniques that are needed for safe

handling and effective use of any herbicide can be obtained from restricted use pesticide certification training. All District applicators and contractor supervisors are required to obtain and maintain this certification before they apply herbicides for the District.

No pesticide may be sold in the United States until the U.S. Environmental Protection Agency (EPA) has reviewed the manufacturer's product data and determined that the use of the product will not present unreasonable risk to humans or the environment.

Is the spraying of chemicals really safe to the environment and public?

Yes, if they are applied in accordance with the directions on the label. Herbicides are designed to interfere with very specific life processes within certain plants. Because the basic nature of plant processes is different from animal processes, these chemicals have little effects upon animals and humans. The herbicides used for controlling vegetation go through a very rigorous process of testing their effects on many plants and animals. This process takes 12 to 15 years before the EPA will allow it to be labeled for use. Once it becomes labeled it must also go through a periodic review process to make sure that no long-term effects become known.

The EPA approves use of pesticides on specific sites, i.e., for use on individual crops, terrestrial non-crop areas or aquatic settings. Only those herbicides registered by the EPA specifically for use in aquatic sites can be applied to plants growing in lakes, rivers, canals, etc. For terrestrial uses, EPA requires herbicide labels to have the statement: "Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high-water mark." Rodeo® is registered for aquatic use and can be applied directly to water. Certain, but not all, products that contain 2,4-D can also be applied directly to water. The state supplemental Special Local Need label for the imazapyr-containing product, Arsenal® (EPA SLN NO. FL-940004) allows Government agencies in Florida and their contractors to use it to control melaleuca and Brazilian pepper growing in water. Each herbicide label contains specific use guidelines that must be followed in order to use the product legally. In Florida, the Florida Department of Agriculture and Consumer Services (FDACS) reviews and approves any pesticides sold and used as herbicides.

HERBICIDE TOXICITY TO WILDLIFE

Invasive plant management is often conducted in natural areas with the purpose of maintaining or restoring wildlife habitat. Therefore, it is essential that the herbicides are not toxic to wildlife. Herbicides used for invasive plant control have shown very low toxicity to wildlife that they have been tested on, with the exception of the relatively low LC50 (0.87 ppm) of triclopyr ester and fluazifop (0.57 ppm) for fish, neither of which can be applied directly to water. However, because triclopyr ester and fluazifop are not applied directly to water, are adsorbed by soil particles, and have low persistence, exposure is low, which results in low risk when properly used.

MANUAL AND MECHANICAL REMOVAL:

Manual removal is very time consuming, but is often a major component of effective invasive plant control. Seedlings and small saplings of some tree species can sometimes be pulled from the ground, but even small seedlings of some plants have tenacious roots that will prevent extraction or cause them to break at the root collar. Plants that break off at the ground will often resprout and even small root fragments left in the ground may sprout. Repeated hand pulling or follow-up with herbicide applications are often necessary. Removal of uprooted plant material is important. Stems and branches of certain species (i.e., melaleuca) that are laid on the ground can sprout roots, and attached seeds can germinate. If extracted plants cannot be destroyed by methods such as burning or removed entirely from the site, they should be piled in a secure area that can be monitored for new plant growth.

Mechanical removal involves the use of bulldozers, or specialized logging equipment, to remove woody plants. Intense follow up with other control methods is essential after the use of heavy equipment because disturbance of the soil creates favorable conditions for

regrowth from seeds and root fragments, and re-colonization by other invasive non-native plants. Mechanical removal may not be appropriate in natural areas because of disturbance to soils and non-target vegetation.

In aquatic environments, mechanical controls include self-propelled harvesting machines, draglines, cutting boats and other machines, most of which remove vegetation from the waterbody. This equipment is generally used for clearing boat trails, high-use areas, or locations where immediate control is required, like flood control canals and around water control structures.

BIOLOGICAL CONTROL:

Plants are often prevented from becoming serious weeds in their native range by a complex assortment of insects and other herbivorous organisms. When a plant is brought into the United States, the associated pests are thoroughly screened by government regulations on plant pest importation. Favorable growing conditions and the absence of these associated pest species have allowed some plants to become serious weeds outside their native range.

"Classical" biological control seeks to locate such insects and import host-specific species to attack and control the plant in regions where it has become a weed. The "classical" approach has a proven safety record (none of the approximately 300 insect species imported specifically for this purpose have ever become pests themselves) and has been effective in controlling almost 50 species of weeds.

The following are the performance steps of a classical biological control investigation:

- 1. Identify target pest and prepare a report outlining the problem conflicts and potential for a successful program, etc.
- 2. Survey and identify the pest's native range for list of herbivores that attack the pest plant.
- 3. Identify the best potential biocontrol agents based on field observations, preliminary lab tests, and information from local scientists.
- 4. Conduct preliminary host-range tests on the most promising candidate in native country to obtain permission to import to U.S. quarantine.
- 5. Complete host-range tests in U.S. quarantine to ensure safety of the organism relative to local native plants, agricultural crops, and ornamental.
- 6. Petition Technical Advisory Group of USDA for permission to release in the U.S. Also, obtain permission from necessary state agencies.
- 7. Culture agents that are approved to have sufficient numbers to release at field sites. Test release strategies to determine best method.
- 8. Monitor field populations of pest plants to:
 - a) Determine if biocontrol agent establishes self-perpetuating field populations

- b) Understand plant population dynamics to have baseline to measure bioagent effects, especially if they are sublethal and subtle and to know what portions of life history to watch.
- 9. Study effectiveness of the agents for controlling the target plant. Monitor plant populations with and without the agent to determine impacts of agent.
- 10. Study means of integrating biocontrol into overall management plans for the target plant.

In Florida, classical biological control of invasive non-native plants in non-agricultural areas has focused on aquatic weeds. The first such biocontrol agent introduced was the alligatorweed flea beetle (*Agasicles hygrophila*) in 1964 for control of alligatorweed

(Alternanthera philoxeroides). the alligatorweed Subsequently, thrips (Aminothrips andersoni) was released 1967 and in the alligatorweed stem borer (Vogtia malloi) in 1971. The flea beetle and stem borer proved to be very effective for suppressing growth of alligatorweed; although, harsh winters can reduce their populations the northern range alligatorweed. Less effective have introductions been of the waterhyacinth weevils (Neochotina eichhorniae and N. bruchi), released 1972 and 1974, and waterhyacinth borer, released in 1977 (Sameodes albigutalis). Likewise, effectiveness of a weevil (Neohydronomous affinis) and a moth (Namangama pectinicornis) released for control of waterlettuce has been unpredictable. Waterhyacinth and waterlettuce continue to be problems that require management by other methods such as herbicide and mechanical harvesting. Current biological control research is focused on hydrilla, waterhyacinth, melaleuca,

Why is there so much more reliance on herbicides rather than other methods to control these pests?

Ideally, herbicides would not be the primary method for controlling these exotic plants. However, the options for managing these plants are limited. The reality is that herbicides will always be the most common control method. Biological controls are not always a viable option. Even when they are an option, many years and hundreds of thousands of dollars are required to study insect and disease agents before they can be introduced as a potential control agent. It is impossible to predict how effective these introduced agents will be until they are released and studied. Thirty percent of introduced agents don't even survive in their new environment. Another 30% survive, but provide no real control of the intended target. With these odds, it is imperative that other control initiatives be undertaken in the interim. If biological controls prove to be effective, herbicide controls can be phased out, or greatly reduced. Mechanical controls such as harvesters are often limited due to inaccessibility or site disturbance concerns, especially in natural areas. Physical controls such as hydrologic manipulation or fire are limited and not always practical, and may be completely ineffective against some species. Where possible, control options are integrated to the greatest extent possible.

Brazilian pepper, and Old World climbing fern.

Introduction of animals such as cattle, sheep, goats, or weed-eating fish may also be used to control certain invasive plants. However, environmental impacts of using such nonselective herbivores in natural areas should be carefully considered before implementation.

PHYSICAL METHODS:

Prescribed burning and water level manipulation are cultural practices that are used in management of pastures, rangeland and commercial forests, and, in some situations, may be appropriate for vegetation management in natural areas. Land use history is critical in understanding the effects of fire and flooding on the resulting plant species composition. Past practices affect soil structure, organic content, seed bank (both native and invasive exotic species), and species composition. While there is evidence that past farming and timber management practices will greatly influence the outcome of physical management, very little is known about effects of specific historical practices. Similar management practices conducted in areas with dissimilar histories may achieve very different results. Even less is known about the effects of invasive plants establishing in these communities and the subsequent management effects of fire on the altered communities.

Understanding the reproductive biology of the target and non-target plant species is critical to effective use of any control method but particularly so with methods such as fire management, that often requires significant preparation time. Important opportunities exist when management tools can be applied to habitats when non-native invasive species flower or set seed at different times than the native species.

PRESCRIBED BURNING

Fire is a normal part of most of Florida's ecosystems and native species have evolved varying degrees of fire tolerance. Throughout much of the Everglades, for example, suppression of fire has altered historical plant communities. Within these communities, the fire-tolerant woody species have lingered in smaller numbers, and less fire-tolerant species have replaced ephemeral herbs. Little is known about the amount, frequency, timing, and intensity of fire that would best enhance the historically fire tolerant plant species, and less is known about how such a fire management regime could be best used to suppress invasive species. Single fires in areas with many years of fire suppression are unlikely to restore historical species composition. Periodic fires in frequently burned areas do little to alter native species composition.

Invasion of tree stands by exotic vines and other climbing plants – such as Old World climbing fern on Everglades tree islands - has greatly increased the danger of canopy (crown) fires and the resulting death to mature trees. The added biomass by invasive plants can result in hotter fires and can greatly increase the risk of fires spreading to inhabited areas. In these situations, use of fire to reduce standing biomass of invasive

species may better protect the remaining plant populations than doing nothing, even though impacts to non-target native species will occur.

Fire, as an integrated management tool, has proven to be a beneficial method in managing exotic species. The burning of torpedograss, for example, followed by a herbicide application, has been shown to be much more effective at controlling this perennial than herbicide application alone.

WATER LEVEL MANIPULATION

Some success has been achieved by regulating water levels to reduce invasive plant species in aquatic and wetland habitats. De-watering aquatic sites reduces standing biomass, but little else is usually achieved unless the site is rendered less susceptible to repeated invasion when re-watered. In some cases, planting native species prior to rewatering may reduce the susceptibility of aquatic and wetland sites to reinfestation of exotics.

In most situations, water level manipulation in reservoirs has not provided the level of invasive plant control that was once thought achievable. Ponds and reservoirs can be constructed with steep sides to reduce invadable habitat, and levels can be avoided that promote invasive species, but rarely are these management options adaptable to natural areas.

Carefully timed water level increases following herbicide treatments, mechanical removal or fire management of invasive species can sometimes control subsequent germination, and, with some exotic species, resprouting.

I.E Target Species Descriptions

MELALEUCA QUINQUENERVIA

Common Names: Melaleuca, paper-bark, cajeput, punk tree, white bottlebrush tree

 $\textbf{Synonymy}: \ \textit{Melaleuca} \ \textit{leucadendron} \ (L.) \ L.$

misapplied

Origin: Australia, New Guinea, and Solomon

Islands

Family: Myrtaceae, Myrtle Family

Ecological Significance: In its native range, melaleuca grows in low-lying flooded areas and is especially well-adapted to ecosystems that are periodically swept by fire. These are common



conditions in south Florida, making the region an ideal habitat for colonization. Melaleuca readily invades canal banks, pine flatwoods, cypress swamps, and uninterrupted sawgrass prairies of south Florida. It grows extremely fast, producing dense stands that displace

native plants, diminish animal habitat, and provide little food for wildlife. Until recently, melaleuca was a significant threat to the Water Conservation Areas and Lake Okeechobee. Intense management efforts since 1990 have reduced this threat and melaleuca will be under maintenance control in most of these areas in less than five years.

SCHINUS TEREBINTHIFOLIUS

Common Names: Brazilian pepper, Florida holly, Christmas berry, pepper tree

Synonymy: none

Origin: Brazil, Argentina, Paraguay **Family**: Anacardiaceae, Cashew family

Ecological Significance: Brazilian pepper has invaded a variety of areas including, but not limited to, fallow farmland, pinelands, hardwood hammocks, roadsides, and mangrove forests, in areas with a high degree of disturbance and natural areas with little disturbance. Brazilian



pepper forms dense thickets of tangled woody stems that completely shade out and displace native vegetation. It has displaced some populations of rare listed species, such as the Beach Jacquemontia (*Jacquemontia reclinata* House, U.S. and Fla. Endangered), and Beach Star (*Remirea maritima* Aubl., Fla. Endangered). It is a very common roadside and fence row colonizer in south Florida.

CASUARINA EQUISETIFOLIA, CASUARINA GLAUCA

Common Names: Australian pine, beefwood, ironwood, she-oak, horsetail tree

Synonymy: Casuarina littorea L. ex Fosberg &

Sachet, C. litorea Rumpheus ex Stickman

Origin: Australia, south Pacific Islands,

southeast Asia

Family: Casuarinaceae, Beefwood Family

Ecological Significance: Three species of Australian pine trees invade Florida's wild lands. Since their introduction in the late 1800s, they have been widely planted throughout the southern



peninsula. Australian pine grows very fast (1-3 meters per year), is salt-tolerant, and readily colonizes rocky coasts, dunes, sandbars, spoil islands, and invades far inland moist habitats, such as the East Everglades Area of Everglades National Park. It forms dense forests, crowding out all other plant species. It has crowded out vast areas of natural vegetation along Florida's coastline where the public vehemently opposes any removal efforts. Australian pine can encourage beach erosion by displacing deep-rooted native vegetation, and interfere with the nesting of endangered sea turtles and the American crocodile. This large tree is easily toppled in strong winds. As such, this nuisance species is a primary target for removal along canal levees in coastal southeast Florida.

LYGODIUM MICROPHYLLUM

Common Name: Old World climbing fern

Synonymy: Lygodium scandens (L.) Sw., Ugena

microphylla Cav.

Origin: Tropical Asia, Africa and Australia **Family**: Lygodiaceae, Climbing Fern Family

Ecological Significance: Old World climbing fern has become a serious threat to south Florida natural areas, especially the Everglades, where it is increasing in density and range. Old World climbing fern has reached a critical mass in south



Florida such that natural resource managers and private landowners throughout the southern peninsula are constantly reporting new populations, presumably from windborne spores. Old World climbing fern forms dense mats of rachis plant material. These thick, spongy mats are slow to decompose, exclude native understory plants and can act as a site for additional fern colonization. It is difficult for other plant species to grow through the dense mat made by this fern, reducing plant diversity. Large expanses of fern material also may alter drainage and water movement. Management efforts for this species are still being developed. In the meantime, this introduced fern continues to spread unobstructed.

PANICUM REPENS

Common Name: Torpedograss

Synonymy: none

Origin: Old World; Africa, Asia, Australia,

Europe

Family: Gramineae

Ecological Significance: Torpedograss is the most widely dispersed invasive exotic plant in Florida. It is found in more than 80% of Florida's public lakes and rivers. When torpedograss reaches a high density, diverse



native plants are displaced by the exotic plant's thick, monotypic growth form. Impacted areas no longer provide productive habitat for sport fish and other wildlife. Torpedograss has displaced more than 16,000 acres of native plants in Lake Okeechobee since the early 1970's and has the potential to cover much of the lake's 100,000-acre marsh. It is also a serious agriculture weed, infesting 19 crops in 27 countries. The District initiated a control program for this species on Lake Okeechobee in fiscal year 2001.

EICHHORNIA CRASSIPES

Common Names: Waterhyacinth, waterorchid **Synonymy**: *Piaropus crassipes* (Mart.) Britt.

Origin: Amazon basin

Family: Pontederiaceae, Pickerelweed Family

Ecological Significance: Waterhyacinth is reported as a weed in 56 countries. It was introduced to the United States in 1884 at an exposition in New Orleans, reaching Florida in 1890. By the late 1950s, waterhyacinth occupied



about 51,000 ha of Florida's waterways. It grows at explosive rates exceeding any other tested vascular plant, doubling its populations in as little as 6 to 18 days. In large mats, it degrades water quality and dramatically alters native plant and animal communities. Large mats of waterhyacinth can collect around water control structures and impede flow. Waterhyacinth is considered to be under maintenance control in all District managed waters.

PISTIA STRATIOTES

Common Name: Waterlettuce

Synonymy: none

Origin: Africa or South America **Family**: Araceae, Arum Family

Ecological Significance: Similar to waterhyacinth, waterlettuce is capable of forming vast mats that disrupt submersed plant and animal communities. These mats can collect around water control structures and interfere with water movement and navigation. It is considered a



serious weed in Ceylon, Ghana, Indonesia, and Thailand and at least present as a weed in 40 other countries. Like waterhyacinth, this species is considered to be under maintenance control in all District managed waters.

HYDRILLA VERTICILLATA

Common Name: Hydrilla, water thyme, Florida elodea, waterweed

Synonymy: none

Origin: Warmer regions of the Old World Family: Hydrocharitaceae, Frog's-Bit Family Ecological Significance: Hydrilla was introduced into Florida waters in 1960 and spread to all basins in the state by the early 1970's. By 1991, hydrilla was found in 41% of Florida's public water bodies; by 1994, it was found in 43%, with an estimated coverage of



95,000 acres. This plant competitively displaces native submersed plant communities. Hydrilla grows in dense stands, alters fisheries populations, causes shifts in zooplankton communities, and affects water chemistry. Control of hydrilla is a top priority in District managed waters. Its fast rate of growth makes this an important weed to keep in check.

HYGROPHILA POLYSPERMA

Common Name: Hygro, East Indian hygrophila, Mirimar weed

Synonymy: *Justicia polysperma* Roxb., *Hemidelphis polysperma* (Roxb.) Nees in Wall.

Origin: India, Malaysia

Family: Acanthaceae, Water-Willow Family **Ecological Significance**: Hygro appeared in the aquarium trade in 1945 as "oriental ludwigia." It was first collected in Florida near Tampa as an escapee from cultivation in 1965. Naturalized populations on the East Coast, especially one



near the town of Miramar in Broward County, were first brought to public and scientific attention in the late 1970s. Reported as an expanding problem in south Florida canals in 1980, hygrophila has now replaced the well-known hydrilla as the most serious weed in these waterways, clogging irrigation and flood-control systems and interfering with navigation. It has been found in a dozen public lakes and rivers by 1990, and in 18 public water bodies by 1994. Hygrophila is so aggressive that it is able to compete with hydrilla. The plant expands rapidly, in one case from 0.1 acre to over 10 acres in 1 year.

II. Program Component Descriptions

The Vegetation Management Division directs and assists in a wide variety of programs and projects District-wide. The Division also supports field station activities by providing in-house vegetation management training and assisting field station staff with special projects on an as needed basis. This section provides overviews of the Division's major programs. Certain programs - such as melaleuca, lygodium and torpedograss - are focused and are outlined here in a species-specific format. Other programs such as vegetation management activities in canals and prescribed burning do not lend themselves to a species-specific format. Information on management efforts of other exotic invasive species such as hydrilla and Brazilian pepper is included in these program overview sections.

II.A Melaleuca

WHAT IS IT?

Melaleuca is a primary target of the District's exotic plant control operation. District efforts to control melaleuca, along with those of other governmental agencies and private groups, are containing its spread within the Everglades Water Conservation Areas (WCAs) and the marsh of Lake Okeechobee. Melaleuca has been completely cleared from Water Conservation Area 2A, 3A, and 3B, north and south of Alligator Alley. These areas are now under "maintenance control." Today, the melaleuca infestation on SFWMD managed lands is no longer increasing; in many areas, it has been significantly reduced.

The goal of the current melaleuca management program is to contain melaleuca on all District land and to maintain infestation levels as low as possible while minimizing impacts to non-target vegetation. The operational and experimental work accomplished to date demonstrates melaleuca can be effectively and consistently controlled using an integrated management approach. The ultimate control of melaleuca throughout the District will depend primarily on the future availability of funds. The magnitude of the threat of melaleuca and the cost of current control efforts are enormous. However, at the current rate of treatment, melaleuca should be under maintenance control in the Water Conservation Areas and in Lake Okeechobee within the next five years.

WHO DOES IT?

Contractors are primarily used for melaleuca management. Contract work consists of both ground crews and aerial spraying.

WHERE IS IT DONE?

Control of melaleuca in FY01 took place in all of the WCAs, the Pennsuco Regional Offsite Mitigation Area in Miami-Dade County, Cell 17/18 in Broward County, Everglades National Park, and on Lake Okeechobee.

HOW DOES IT GET DONE?

The integrated management of melaleuca requires a combination of control techniques to be effective. The District's efforts in developing melaleuca control methods have been concentrated around herbicidal control and the limited use of mechanical and physical control methodologies. Frill and girdle application of a herbicide solution (25% imazapyr, 25% glyphosate and 50% water) is the primary method used to kill mature trees. However, the Cut/Stump application of herbicide is also very effective, but remaining stumps may create a navigation hazard for airboat traffic when the marsh is wet. This type of application is used only on trees with base stem diameter of less then three inches. Melaleuca seedlings in mixed communities are usually hand-pulled in an effort to minimize the impact of herbicides on non-target vegetation. Seedlings are left hanging on remaining vegetation or put in a pile to reduce the potential for regrowth.

Until recently, aerial applications of tebuthiuron, hexazinone, triclopyr, imazapyr, and combinations of imazapyr and glyphosate have been used on an experimental basis only. This type of application is becoming essential as control operations are closing in on large areas of melaleuca monocultures. Acceptable results have been obtained, using 3 quarts of glyphosate and 3 quarts of imazapyr with 4 quarts methylated seed-oil surfactant in 20 gallons total volume, in large-scale aerial application.

Under ideal conditions, melaleuca can be eliminated from an area within two years. The first phase of control targets all existing trees and seedlings in a given area. Using navigational equipment, the second phase consists of crews returning to the same site to remove any seedlings resulting from the control activities of the previous year. The third phase entails the long-term management of melaleuca, surveillance and inspection of previously treated sites to monitor the effectiveness of the melaleuca control program and maintain reinfestation levels as low as possible.

HOW MUCH DOES IT COST?

In FY01, the District spent a total of \$2,795,000 on melaleuca management. The source of these funds are from the Florida Department of Environmental Protection, mitigation dollars and District ad valorem taxes.

SFV	SFWMD's Melaleuca Management Funding Sources.						
FY	FP&L	DEP	Mitigation	SWIM	COE	SFWMD	TOTAL
91	\$500,000			\$300,000		\$170,000	\$970,000
92	\$500,000					\$250,000	\$750,000
93	\$500,000			\$200,000		\$800,000	\$1,500,000
94		\$400,000		\$200,000		\$885,000	\$1,485,000
95		\$1,000,000		\$400,000		\$885,000	\$2,285,000
96		\$1,000,000		\$400,000	\$68,000	\$885,000	\$2,353,000
97		\$1,000,000			\$300,000	\$1,045,000	\$2,345,000
98		\$1,000,000	\$300,000		\$244,794	\$1,045,000	\$2,589,794
99		\$1,000,000	\$400,000			\$1,045,000	\$2,445,000
00		\$1,000,000	\$300,000			\$1,045,000	\$2,435,000
01		\$1,100,000	\$650,000			\$1,045,000	\$2,795,000
\$\$	\$1,500,000	\$7,500,000	\$1,650,000	\$1,500,000	\$612,794	\$9,100,000	\$21,862,794

SFV	SFWMD's Melaleuca Management Expenditures					
FY	WCAs	L.O. ¹	Mitigation	Biocontrol	Support ²	TOTAL
91	\$614,437			\$75,000	\$15,000	\$704,437
92	\$823,552			\$75,000	\$75,000	\$973,552
93	\$904,923	\$211,159		\$165,000	\$75,000	\$1,356,082
94	\$634,337	\$538,841		\$150,000	\$135,000	\$1,458,178
95	\$1,025,109	\$573,859		\$195,000	\$135,000	\$1,928,968
96	\$1,460,098	\$1,064,216		\$150,000	\$135,000	\$2,809,314
97	\$970,243	\$1,042,037		\$150,000	\$135,000	\$2,327,643
98	\$449,698	\$1,074,813	\$301,398	\$150,000	\$135,000	\$2,450,888
99	\$640,886	\$1,166,497	\$384,524	\$150,000	\$135,000	\$2,476,907
00	\$702,338	\$1,119,369	\$160,453	\$150,000	\$135,000	\$2,267,160
01	\$1,035,911	\$664,280	\$258,790	\$150,000	\$135,000	\$2,243,981
\$\$	\$9,261,532	\$7,455,071	\$1,105,165	\$1,245,000	\$1,245,000	\$20,613,768

¹- Lake Okeechobee

II.B Lygodium

WHAT IS IT?

The District's Vegetation Management Division has been actively involved in field research of control efforts for lygodium since 1997. The first large-scale herbicide treatment of lygodium by the District was in January of 1999 at CREW and the DuPuis Management Area. Climbing fern control options include preventative, herbicidal,

²- Support to Loxahatchee Wildlife Refuge and Everglades National Park

biological, mechanical and physical methods. It is extremely important that the District, as well as other land managers, identify and treat small populations of exotic climbing fern before they become substantial infestations. Early detection and treatment is crucial to successful and economical management of this plant. Biological control may hold the key to effective long-term regional management of this species; however, overseas searches have just begun for biocontrol agents in the fern's native range. Significant populations of lygodium now exist on Water Conservation Area tree islands, remote cypress domes in the Big Cypress National Preserve, Shark Valley, Kissimmee River, and in backcountry areas of the Ten Thousand Islands.

WHO DOES IT?

Some lygodium research/control efforts are conducted in-house, but the majority of the research and control efforts are contracted.

WHERE IS IT DONE?

To date, field research has been conducted at DuPuis, Barley Barber Swamp, Reese Groves (north Palm Beach County), Loxahatchee National Wildlife Refuge (LNWR), Corkscrew Regional Ecosystem Watershed (CREW), and J.W. Corbett Water Management Area (Corbett). During FY01, District contractors conducted lygodium control at DuPuis, CREW, Kissimmee River, STA-2, and the Rheinhart property. Inhouse crews treated lygodium along the L-65 levee.

	Lygodium Control – Field Research and Control						
Date	Project	Location	Participants	Treatment/Study	Result		
Feb. 1997	Herbicide screening trials	DuPuis	In-house	 Rodeo Garlon 3A Garlon 3A & Rodeo Weedar64 Weedar64 & Rodeo Pathfinder (all max rates) 	All products defoliated fern on contact. Pathfinder, green tissue browned.		
Feb. 1997	Herbicide screening trials	Barley Barber Swamp	District, UF Center for Aquatic and Invasive Plants (CAIP), FPL, FDEP	 Rodeo Garlon 3A Garlon 3A & Rodeo Weedar64 Weedar64 & Rodeo (all max rates) 	All plots showed browning w/in one month. No signs of translocation.		
May 1997	Weed whacking, herbicides, burning and flooding	Barley Barber Swamp	District, UF CAIP, FPL, FDEP	 trimming followed by flooding burning followed by flooding herbicide followed by flooding scythe 	Lygodium re-grew in all plots		
June 1997	Herbicide strip plots	Reese Groves	In-house	Pathfinder– 2' carpet treated in 'strips'	Little evidence of translocation		

	Lygod	ium Control – Fi	ield Research and	d Control (cont.)	
Date	Project	Location	Participants	Treatment/Study	Result
June 1997	Herbicide trellis plots	Reese Groves	In-house	 Rodeo Garlon 3A Finale (applied in 4' band around base of trellis) Pathfinder (applied in 1', 2', 4', 6' around base of trellis) 	Only Pathfinder translocated
Nov 1997	Fire/repeat herbicide and floristic plots	Reese Groves	District, UF CAIP, Palm Beach Co.	 burning alone burning followed by repeat herbicide applications 	Results pending
Nov 1997 May 1998	Herbicide and rate study	Reese Groves	District, UF CAIP	2,4-D amineGarlon 4Rodeo(5 different rates)	Results pending
Jan 1998	Lygodium biocontrol	Overseas	District, USDA	Overseas research initiated for lygodium biocontrols	5-year contract
June 1998	Contact/band triclopyr widths	Reese Groves	District, UF CAIP	Garlon 4 (applied at 4 band widths, 0.1m, 0.4m, 0.7m, 1.0m)	Results pending
Nov 1998	Long-term monitoring ground plots	LNWR, Corbett, DuPuis	District, Institute for Regional Conservation (IRC)	Long-term plots established in cypress swamps, tree islands, flatwoods, roller- chopped flatwoods	Sampled every two years – ongoing study
1993, 1995, 1997, 1999 and 2001	Aerial survey	South Florida from North rim of Lake Okeechobee south	District, IRC	2.5 mile aerial transects (see Monitoring II.D)	Sampled every two years – ongoing study
Jan 1999	Aerial treatments	DuPuis, CREW	In-house	2,4-DRodeo(max rates)Treated in winter	Results pending
Jan 1999 – present	Aerial treatment program evaluation	DuPuis, CREW, Corbett	District, UF-CAIP	2,4-DRodeo (max rates) Treated in winter	Ongoing study
Jan 2000	Aerial treatments	Corbett, DuPuis	In-house	2,4-DRodeo (max rates)Treated in winter	Results pending

HOW DOES IT GET DONE?

Treatment of individual plants is the most conservative and effective approach in natural areas; however, locating, accessing and treating individual plants can be extremely time-consuming. Thus, the District is constantly investigating less time-consuming and costly methods of herbicide application. Aerial applications of herbicides at certain times of the year may, in some cases, reduce non-target damage. Wintertime aerial applications in deciduous cypress forests have been preliminarily successful in controlling the fern without significant damage to native species.

HOW MUCH DOES IT COST?

Lygodium control funds, \$75,000 per year, comes from ad valorem sources. Of these funds, approximately \$60,000 is spent on research (both field trials and biocontrol), and \$15,000 is spent on lygodium control on District lands.

II.C Torpedograss in Lake Okeechobee

WHAT IS IT?

For the last several decades, the Florida Department of Environmental Protection (DEP) and the District have tracked the expansion of torpedograss in Lake Okeechobee from its first reports of several hundred acres by DEP in the early 1980s to 16,000 acres reported on the SFWMD's 1996 digital vegetation map. Since the publication of this map, it is estimated the plant has continued its expansion in the lake to cover at least 18,000 acres.

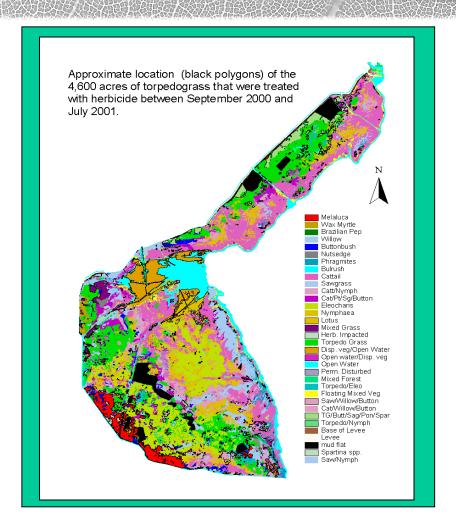
According to the SFWMD's five-year torpedograss management plan for Lake Okeechobee, initial control efforts will aim to limit the plant's further expansion into new areas of the lake. After establishing boundaries from expansion fronts, management will proceed in areas already densely overtaken by the grass.

WHO DOES IT?

Contractors are used for torpedograss management in Lake Okeechobee. The contracts consist primarily of ground crews and aerial spraying.

WHERE IS IT DONE?

In fiscal year 2001, torpedograss management took place in the 100,000 acre marsh on the west side of Lake Okeechobee.



HOW DOES IT GET DONE?

In FY01, imazapyr herbicide was used to treat 3,000 acres of torpedograss in Lake Okeechobee. Trial applications of other herbicides and application methods have been made in the past several years. Cooperative plans are underway with DEP and the University of Florida to evaluate the effectiveness of fungal inoculation to control torpedograss in the Lake. Different herbicides, or combinations of herbicides, may control torpedograss effectively and cause less damage to native plants. Research continues which may modify methods if new methods are found which are less costly, increase effectiveness of torpedograss control, minimize herbicide damage to non-native plants or integrate non-herbicide control techniques.

HOW MUCH DOES IT COST?

In FY01, \$500,000 was spent to treat approximately 3,000 acres. DEP has committed to fund current and future years' Lake Okeechobee torpedograss control including \$1 million for FY02, which will follow the established torpedograss management plan.

II.D Tree Management

WHAT IS IT?

The Tree Management Program is one part of the extensive South Florida Water Management District canal/levee maintenance program. Maintenance is performed, in varying degrees, throughout the District's area of responsibility in accordance with statutory requirements, mission statements and Interagency Agreements.

The main purpose for the Tree Management Program is to assist the District's Field Stations with removing vegetation, primarily trees, which could impede water flow and prevent adequate flood protection in a storm event. Additionally, trees and other vegetation are removed from canal right of ways to establish areas from which a wide variety of maintenance functions can be performed.

Also, as part of the maintenance program, areas along District canals, structures and other District facilities are landscaped using xeriscape principles. The rationale is to reduce the maintenance needs in remote locations or areas that are difficult to maintain using conventional methods.

WHO DOES IT?

Contractors are used for projects that require specialized equipment and/or numerous man-hours.

WHERE IS IT DONE?

In FY01, hazardous and exotic tree removal projects occurred along the following District canals: L-19 & L-20, C-1W, South Fork of the New River, C-43, S-65, C-25, Hillsboro Canal, C-51, C-32G, C-25 Ext., C-15, S-59, S-65A, L-30, and C-10.

The installation of plants was postponed during the year 2001 drought. Near the latter part of the year vegetation was installed at S-118, S-119, S-65A, S-37A, the Spillway Park at S-155 and along a county canal adjacent to the entrance of the Miami Field Station. A variety of native trees were purchased for the Kissimmee Field Station's vegetation management crew to install along the C-31 canal. This installation was completed to replace canopy that was lost during an exotic tree removal, also performed by the field station.

Vegetation, which helps stabilize the canal banks, was installed along the L-19, C-29A, and Hillsboro canals.

HOW DOES IT GET DONE?

The Environmental Horticulture Section, in conjunction with OMD Regional Directors, developed a long-term Tree Management Plan. The plan is comprised of projects designated by the Regional Directors for their specific area. Numerous parameters are taken into consideration such as the canal's flood protection capability, proximity to structures, and types of vegetation, when prioritizing the projects. A revegetation plan and/or a method of bank stabilization may follow the tree removal project.



HOW MUCH DOES IT COST?

The above projects occurred in fiscal year 2001 using ad valorem funds at a total cost of \$743,000.

II.E Vegetation Management in Canals

WHAT IS IT?

For District canals, the vegetation management performance standards include: 1) maintaining 99% of canal unobstructed by targeted floating plants (i.e. waterhyacinth and waterlettuce) and 100% clear around water control structures; 2) maintaining more than 50% of water column unobstructed by targeted submersed vegetation (i.e. hydrilla and hygrophila) in accordance with prioritized workplans; 3) maintaining targeted emergent plants (i.e. floating hearts and cattail) 90% clear of waterbody only when impairment of

intended use occurs; and, 4) maintaining targeted ditchbank vegetation in accordance with prioritized workplans. These maintenance standards have been developed through years of experience, observation, and research with flowing water systems under a wide variety of conditions of plant populations size, weather factors, and waterbody configurations.

WHO DOES IT?

This work is performed using a combination of contractors and in-house crews.

WHERE IS IT DONE?

In FY01, over 15,000 acres of aquatic nuisance vegetation were treated in the following regions: Big Cypress Basin, Okeechobee, Kissimmee, West Palm Beach, Clewiston, Miami, Homestead and Ft. Lauderdale.

	FY01 Acres Treated								
	BCB	OKE	KIS*	WPB	CLE	MIA	HOM	FTL	TOTAL
Ditchbank	1053	627	725	1139	3899	662	381	1357	9843
Emersed	242	54	0	337	120	6	0	26	785
Floating	103	2016	1004	1090	774	27	0	199	5213
Submersed	208	6	0	0	0	0	10	19	243
TOTAL	1606	2703	1729	2566	4793	695	391	1601	16084

*KIS acres do not include hydrilla treatments funded by FDEP

HOW DOES IT GET DONE?

A variety of methods are employed to achieve maintenance control in District canals. These methods range from mechanical control, including self-propelled harvesters, draglines, cutting boats, mowers and other machines (most of which remove the vegetation from the canal) to herbicidal control, which involves the judicious placement of chemicals on the targeted plants, usually by spraying liquid solutions of herbicides from boats. Another method used in many of the southern canals is the placement of grass carp as a biological control agent (see Biological Control section). Specific uses of control methods include the use of fluridone to control hydrilla, the use of an aquatic imazapyr to control emergent weeds such as floating hearts, and the use of grass carp to control hygrophila.

HOW MUCH DOES IT COST?

In FY01, approximately \$1.8 million was spent controlling aquatic vegetation in District canals.

FY01 Costs of Treatments						
Field Station	Amount					
Big Cypress Basin	\$279,146.88					
Okeechobee Field Station	\$282,935.98					
Kissimmee Field Station*	\$376,628.53					
West Palm Beach Field Station	\$195,493.24					
Clewiston Field Station	\$312,073.44					
Miami Field Station	\$80,243.75					
Homestead Field Station	\$52,501.08					
Ft. Lauderdale Field Station	\$181,940.27					
TOTAL	\$1,760,963.17					

^{*}less fluridone chemical costs funded by FDEP

II.F Vegetation Management in Lake Systems

WHAT IS IT?

The goals of aquatic weed management in lake systems within the SFWMD are preservation of healthy habitat for native aquatic plants and animals and maintenance of flood protection, water supply, navigation, and other functions required by society. In order to achieve these goals, the program endeavors to maintain 99.9% of the waterbody unobstructed by targeted floating plants. In addition, the program works with multiple agencies to maintain submersed and emersed plants in the waterbody in accordance with interagency objectives (i.e., fisheries, water flow, navigation, and habitat stabilization). Since the lakes are under multiple agency jurisdictions, regular meetings are held with agency personnel to determine management objectives.

The submersed aquatic weed, hydrilla, and the floating weeds, waterlettuce and waterhyacinth are the primary aquatics managed in the lake systems. Control of these plants in public waters remains a top priority since these plants grow rapidly and readily impair water management, navigation, and native plant and wildlife communities.

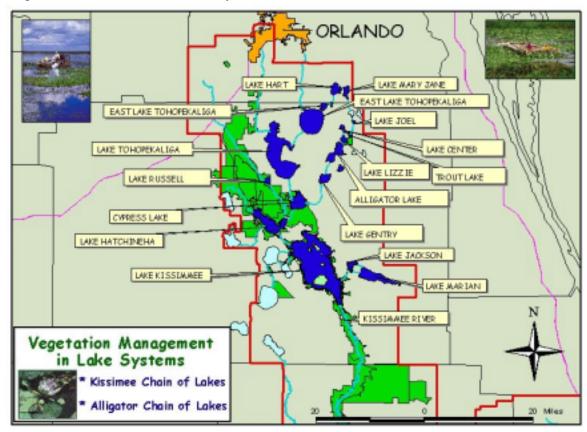
Growths of "floating islands," or tussocks frequently occur in many south Florida aquatic settings and may seriously impair the same aquatic functions mentioned above. These freely-floating mats of assorted species initially often consist of fast-growing aquatic and marsh plants including fragrant flatsedge (*Cyperus odoratus*), primrose willow (*Ludwigia octovalvis/peruviana*), paragrass (*Urochloa mutica*), pennywort (*Hydrocotle* spp.), and root growth, especially, binds them together ever more tightly. Older tussocks may become very dense and heavy with accumulated sediments and old plant material. More developed tussocks also frequently support woody species such as willow (*Salix* spp.) and swamp maple (*Acer rubrum*). Such older tussocks may also take root to sediments, more permanently overtaking shallow littoral areas.

WHO DOES IT?

The aquatic plant control work mainly takes place in the Kissimmee River and Kissimmee Chain-of-lakes and is primarily performed by in-house staff, and contractors are also used as needed. The US Army Corps of Engineers performs aquatic plant management on Lake Okeechobee.

WHERE IS IT DONE?

The lakes and related waterbodies maintained by SFWMD lie primarily in Osceola, Polk, Highlands, and Okeechobee County.



HOW DOES IT GET DONE?

Herbicide applications constitute the primary treatments for three main target weeds: hydrilla (*Hydrilla verticillata*), waterhyacinth (*Eichhornia crassipes*) and waterlettuce (*Pistia stratiotes*). Hydrilla in south Florida consists entirely of female clonal plants; hence, no seed propagation has been documented here. Waterhyacinth and waterlettuce both wildly propagate by vegetative means, but also produce copious viable seed.

Hydrilla is primarily managed with fluridone, a systemic herbicide that combats the plant's subterranean tubers, thousands of which are produced per square meter with each tuber

capable of generating a new plant. Other aquatic herbicides, including endothall and diquat dibromide, effectively attack the aquatic portions of the plant but do not directly affect the underground tubers. Control has been somewhat variable and limited by available funding, varying aquatic conditions and newly reported "resistance" of hydrilla to fluridone herbicide. Hydrilla management methods continue to be refined in the face of these changing conditions. However, formerly overwhelming hydrilla infestations have generally been reduced by successive years of treatment.

Floating weed control in public waters is also performed by SFWMD with DEP grants providing complete reimbursement. Control of floating weeds in the Kissimmee River and the Kissimmee Chain-of-lakes is done primarily using diquat dibromide and 2,4-D herbicides. During the past five years, ongoing effort has kept the coverages of these plants at or below targets of less than one-percent coverage of any water body at any time.

Floating islands, or tussocks, are frequently removed physically with shore-based equipment such as draglines, or harvesting vessels such as mechanical harvesters. This is costly, yet herbicide treatments often only defoliate well-developed tussocks, leaving moist mats of dead material that are quickly covered by new plants. Younger, less-developed tussock formations may break up after applications of 2,4-D and/or glyphosate herbicides. In this instance, herbicide applications may be effective.

HOW MUCH DOES IT COST?

The actual costs for controlling aquatic plants in lake systems in FY01 was \$7.1 million. Since these lakes are sovereign submerged state lands, costs are reimbursed for the work within a grant program administered by the Florida Department of Environmental Protection. During the 1990s, several hundred to several thousand acres of hydrilla were annually treated in varying parts of the Kissimmee Chain-of-lakes, at an average cost of \$700 per treated acre. During this time annual DEP hydrilla control grants for the Kissimmee chain have ranged from \$2 to \$6 million. Control of about 10,000 acres of floating weeds in the Kissimmee River and the Kissimmee Chain-of-lakes has cost about \$1,500,000 during each of the past five years.

II.G Prescribed Burning

WHAT IS IT?

Prescribed fire is the controlled application of fire to existing vegetative fuels under specified environmental conditions following appropriate precautionary measures. This practice allows the fire to be confined to a predetermined area and accomplishes the planned management objectives.

Prescribed fire is essential to the management of wildlife, preservation of endangered plant and animal species, and reduction of wildfire damage in the wildland/urban interface area. Many exotic plant species have proven to be fire adaptive and in some cases spread

with the occurrence of fire. The use of fire in combination with herbicide treatment has proven to increase efficacy of treatments by breaking apical dormancy and reducing biomass.

Although prescribed fire can be used alone as a control method, it most frequently is used in combination with herbicide treatment. Torpedograss and melaleuca are the two primary species where fire was used this year as a precursor to herbicide treatments.

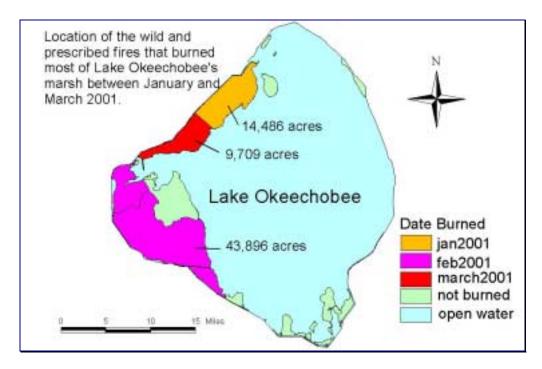
WHO DOES IT?

All prescribed fires were planned and authorizations obtained from the Florida Division of Forestry by a District Certified Burn Manager. Fires are conducted using a combination of in-house, other divisions, contractors and inter-agency crews.

WHERE IS IT DONE?

For FY01, all fires coordinated by the Vegetation Management Division were conducted in the marsh on Lake Okeechobee.

- January 5, 2001 a prescribed fire was conducted on 14,486 acres.
- February 4 through 16, 2001 43,896 acres were burned in the Moore Haven area. This area was scheduled for a prescribed burn. The District provided aerial ignition services to complete this burn, which started as a wildfire.
- March 13, 2001 9,709 acres was burned in the Curry Island area. This area was not scheduled for a prescribed burn at that time. The District provided aerial ignition services to complete this burn, which started as a wildfire.



HOW DOES IT GET DONE?

All fires were conducted using an Aerial Ignition Device System or Heli-Torch, mounted in a helicopter provided under contract to the District by Helicopter Applicators, Inc. The ignition system and firing sequence used were contingent upon vegetative fuel moistures and weather conditions at the time of the burn.

The use of fire in combination with herbicide treatment has increased efficacy and reduced treatment costs thus allowing more effective control of invasive exotic plant infestations in these areas.

HELI-TORCH



System uses a mixture of gasoline and a gelling agent. The heli-torch can ignite approximately 200 acres per 55 gallons of mixture.

AERIAL IGNITION DEVICE SYSTEM



System uses aerial ignition spheres filled with potassium permanganate, which are injected with ethylene glycol and dropped from the helicopter. 1000 spheres will ignite approximately 300 acres.

AERIAL IGNITION DEVICE FIRING PATTERN



Each circle represents where an aerial ignition device sphere has been dropped from the helicopter

HOW MUCH DOES IT COST?

Approximately \$50,000 was spent on burning operations in FY01. All District crew costs associated with the burns were charged to the individual Field Station that assisted with the operation. All inter-agency staff time was absorbed by the individual agency. To help offset inter-agency costs, the District participates in other interagency prescribed fires at no cost to the sponsoring agency. The following is a break down of contract and material costs for the Lake Okeechobee burns in FY01:

- Helicopter Applicators, \$45,000
- Aerial Ignition Spheres, \$3,760
- Gasoline, \$600

II.H Monitoring Programs

WHAT IS IT?

Invasive exotic pest-plants like melaleuca (Melaleuca quinquenervia), Brazilian pepper

(Schinus terebinthifolius), Australian pine (Casuarina spp.), and Old World climbing fern (Lygodium *microphyllum*) are causing widespread damage to communities throughout native south Florida. As these invasive exotics continue to spread throughout the region, there is a need for inventory and monitoring procedures to establish base-line estimates and monitor future changes and success of control programs region-wide. Detection of relatively new (not widespread) invasive species or small infestations of invasive exotic plants is key to developing successful management plans. Additionally, Florida's endangered and threatened plant species face an increasing hazard from these introduced

Why aren't remote sensing technologies used to map spatial distribution of exotic pest-plants?

Where appropriate, these technologies are used. However, the extent to which they have been applied to date has been extremely limited. Current remote sensing technologies, such as satellite data, can not accurately identify small. incipient plant populations, a critical need for natural areas managers. Plants growing under the canopy of other plants, or growing under the water surface can not be detected consistently with remote technologies. Additionally, time and energy spent ground truthing data gained from remote sensing can be labor intensive. Resource managers often opt to simply kill the target species and map treatment sites rather than create detailed coverage maps prior to beginning a treatment program. This technology can be used to map large, monocultures, but the usefulness of this data is questionable.

species, and the rarest native plants can be vulnerable to the overwhelming growth of invasive exotic pest plants.

This program attempts to document the status, distribution, rates of expansion, and habitat preferences of target exotic pest-plants in southern Florida. Old World climbing fern (*Lygodium microphyllum*), melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), and Australian pine (*Casuarina* spp.) are the target species.

WHO DOES IT?

The District uses contract services to conduct this bi-annual region-wide aerial survey of exotic pest plants on all publicly and privately owned lands (excepting large metropolitan areas) in southern Florida.

WHERE IS IT DONE?

Eight million acres in 11 counties - Broward, Charlotte, Collier, Miami-Dade, Glades, Hendry, Highlands, Lee, Martin, Monroe, and Palm Beach - are surveyed to determine the extent and distribution of four exotic pest-plants: Melaleuca, Australian pine, Brazilian pepper, and Old World climbing fern. This survey began in 1993 as a requirement of the Everglades Forever Act. It is repeated every two years. To date, surveys have been conducted in 1993, 1995, 1997, 1999 and 2001.

HOW DOES IT GET DONE?

Fifty flight lines are established by District staff for the entire area from the north rim of Lake Okeechobee south through Key West. These lines are spaced at 2.5 mile intervals in an east/west pattern across the state. The beginning and end point of each line is tied to a point of latitude and longitude to permit future updates of the survey.

Each survey team consists of two observers and the pilot. The fixed-wing aircraft (a Cessna 172 Skymaster, or similar) is equipped with three Global Positioning System (GPS) units, and two data recorders. The pilot uses one GPS unit to navigate along the predetermined flight line. The average airspeed is approximately 120 miles/hour; it will vary depending on head or tailwinds. The average altitude is 500 ft.

Observers are stationed on opposite sides of the plane. Each observer is equipped with a GPS unit and data recorder. A marker on both side windows serves as an aiming device for the observers. The GPS/Data Recorder units are both set to emit a sound at eight-second intervals. When the sound is emitted, a classification is made of a one-acre plot observed through the aiming device. The presence of the primary exotic species, the primary species relative density, and the presence of secondary exotic species, if any, and relative density is recorded. The density classes recorded are: single, sparse, or dense. Single is defined as an individual tree, shrub or stem within the target acre. Sparse is defined as less than 50% infestation of the primary exotic species within the target acre. Dense is defined as greater than 50% infestation of the primary exotic species within the target acre. Density data is not collected for associated exotic species. Observers also note

areas where treatment programs have been implemented. Observers collected approximately 40,000 data points over the entire study area.

HOW MUCH DOES IT COST?

This monitoring is required by the Everglades Forever Act. Funds for this program come from ad valorem taxes. In FY01 the program costs were \$30,000.

II.I Biological Control

WHAT IS IT?

The Vegetation Management Division has been supporting research for biological control agents for over 30 years and has been actively using biocontrols to help control exotic invasive vegetation for almost 15 years. In 1987, the first 1000 grass carp were released in Fish Lake to help control hydrilla and in 1997, the melaleuca weevil was released in Everglades Holiday Park in Broward County.

Melaleuca snout beetles are damaging melaleuca stands and showing signs of range expansion after initial releases in 1997. The first Brazilian pepper insects and additional melaleuca-damaging insects may be approved for release in Florida within a period of years. Overseas surveys and host specificity screening for insects found feeding upon the Old World climbing fern in its native range is ongoing.

WHO DOES IT?

The District contracts with two agencies, United States Department of Agriculture (USDA) and University of Florida, for the investigation and release of insect biological controls. The rearing and release of grass carp are also done through contractual services.

WHERE IS IT DONE?

Approximately 20,000 weevils were released along the Turnpike in Miami in February of 2001. Also, in FY01, over 43,000 grass carp were released in many southern canals in Miami-Dade and Broward counties.

Grass carp



GRASS CARP STOCKINGS								
Initial Stocking				Restocking				
Date	Location	Target	# of Fish	FY 98	FY 99	FY 00	FY 01	
1987 ¹	Fish Lake	Hydrilla	1,000					
1989	Arch Creek	Duckweed	1,500					
1990	C-12	Hydrilla	5,379			280		
1991	C-11, C-11-S	Hydrilla & Hygrophila	16,500		5,300	2,200	3,740	
1993	Holeyland	Hydrilla	210					
1996	C-13	Hygrophila	10,000		1,000	1,520	1,800	
1996	C-100	Hygrophila	21,000		3,350		3,380	
1997	C-14	Hygrophila	16,500			1,640	3,260	
1997	C-8	Hydrilla & Cabomba	12,000		2,000	2,720		
1999	C-9	Hydrilla & Hygrophila	20,000			4,200	4,200	
1999	C-1	Hydrilla & Hygrophila	19,500				3,300	
1999	C-1N	Hydrilla	7,000			1,400		
1999	C-102 (part.)	Hydrilla	3,400			680	2,480	
1999	C-103 (part.)	Hydrilla	7,200			1,440	1,640	
1999	Airport Rd. Canal (BCB)	Hydrilla & Salvinia	900					
2001	C-103 (bal.)	Hydrilla & Hygrophila	5720					
2001	C-102 (bal.)	Hydrilla & Hygrophila	10,305					
2001	C-102N	Hydrilla & Hygrophila	3,435					

¹ 1970 – 1985 District Supports U of F Research with Budgeted Financial Contributions



HOW DOES IT GET DONE?

The USDA began investigations into melaleuca biocontrols in 1991. In 1997 the Australian weevil *Oxyops vitiosa* was introduced and subsequently established in melaleuca dominated regions of Florida. Feeding by *Oxyops* adults and larvae damages meristematic tissues, immature leaves, and flower buds. The Australian psyllid *Boreioglycaspis melaleucae* is waiting final approval for release. Both insects interfere with stem growth and reproductive success, and it is hoped that their establishment in Florida will slow melaleuca's spread on unmanaged lands and reduce the need for follow up treatments in managed areas.

Adult psyllid



Overseas USDA surveys and host specificity screening for insects found feeding upon the Old World climbing fern in its native range began in 1997. Several agents are now in quarantine in Gainesville. The University of Florida leads investigations into Brazilian pepper biocontrols. Several insects are in quarantine in Gainesville and one insect has been petitioned for release in Florida. The District has been funding Brazilian pepper biocontrol research since 1994.

In addition to funding research and release of insect biocontrols, the District also procures weed-eating fish to control certain aquatic plants. Sterile grass carp are used when practical in canals to control submersed vegetation such as hydrilla and hygrophila. More widespread use of this technique is limited by the need for fish barriers.

HOW MUCH DOES IT COST?

Funding for biological controls comes from ad valorem taxes. Other agencies such as DEP and the Corps also support biocontrol investigations and releases in Florida. The following is a breakdown for District-sponsored biocontrol costs in FY01:

- \$150,000 Melaleuca
- \$75,000 Brazilian pepper
- \$75,000 Lygodium
- \$140,000 Grass carp

Can grass carp be used for weed control in ponds, lakes, and canals?

Yes, though they are primarily useful for controlling submersed plants. The District uses a sterile form of the grass carp to avoid the possibility of the fish reproducing in Florida's waters. We have stocked the fish in a number of canals in Miami-Dade and Broward Counties over the past seven years in an effort to reduce reliance upon herbicides and machines to keep the waterways open. Sometimes it is necessary to place fish barriers in the canals to keep the fish from escaping into areas we don't want them to inhabit.

III. SPECIAL PROJECTS

III.A Outreach

Outreach efforts in the form of public speaking, brochures, newsletters, magazines, etc. spread the word about invasive plant management efforts in south Florida. Currently, vegetation management staff produces a national magazine for the Exotic Pest Plant Council, a newsletter for the same audience, brochures on several invasive species and management plans focussed on specific problem plants. Outreach responds to inquiries received from the public about invasive plants and presentations are made to a wide variety of groups ranging from school groups and homeowners associations to professional conference audiences and governmental boards.

III.B Everglades Consolidated Report

Staff members revised and updated the exotic species chapter for the 2002 Everglades Consolidated Report. A synopsis of the program was written for the Executive Summary and new data and information was included in the report. Editorial comments as well as comments and constructive critiques from outside professionals were incorporated into the final version.

III.C Water Use Permits for District Field Stations and Save Our River (SOR) Lands

Vegetation Management division staff worked with staff from the Water Use Division and with staff members from seven field stations and four SOR lands to secure permits for various District-owned and operated wells and pumps throughout the District. A total of seven permits were issued. These permits included DuPuis Reserve, Ft. Lauderdale Field Station, Homestead Field Station, Kissimmee Field Station, Clewiston Field Station, West Palm Field Station and Okeechobee Field Station.

III.D Regulation GIS Support System (RegGSS) – ROW Vegetation Inventory System

As part of the ongoing effort to create an inventory of vegetation on District Rights-of-Way, staff members worked with staff from the Environmental Resource Regulation (ERR) Department to incorporate the needs of Operation and Maintenance staff into a computer application known as RegGSS. RegGSS allows a user to create ArcView maps and to perform ArcView applications in a manner much simpler than conventional ArcView. At the request of Vegetation Management Staff, RegGSS was coded to allow a user to access real-time data from CMMS. A user can simply click on a structure or a canal and pull up real-time work data. If the structure has an automatic data recorder, real-time information from this data recorder can also be accessed. In addition, the user can enter an address into the system and see if the address is near a canal that is the District's responsibility or if it is a 298 district's responsibility. To date, Vegetation Management

Staff, with help from ERR, has put the RegGSS link on computers at the Homestead Field Station, Ft. Lauderdale Field Station, Miami Field Station and Okeechobee Field Station.

III.E Xeriscape Guide

In FY01, Vegetation Management developed most of the elements needed to publish a water-conserving landscape guide for south Florida. This publication is intended to serve as a regional version of, "Waterwise Florida Landscapes," a 2001 state-wide guide published by Florida's five water management districts. The content of this new document will include extensive lists of shrubs, vines, trees, and palms recommended for south Florida landscapes based upon their appropriateness for the region. Also, general information on designing and installing water-conserving landscapes and avoiding the invasive non-native plants that seriously threaten south Florida's ecological integrity.

III.F Inter-district Support

In 1996, the five water management districts formed an Inter-District Exotic Plant Committee to broaden cooperation in the area of vegetation management. The committee is made up of staff from aquatic plant management, upland plant management and land stewardship divisions within each district. The committee recognizes that each district has developed individual – and often well-established - vegetation management programs. Through the Inter-District Exotic Plant Committee, districts are able to coordinate research projects, share much-needed information on control methods (successes and failures), make recommendations to prevent new plant problems, develop methods for assessing plant infestations, and devise strategies to reduce the spread of existing exotic species on water management district (and adjacent) properties. The group has achieved this through innovative partnerships with other governmental agencies and the state university system. The committee routinely helps other agencies (such as the Florida Fish and Wildlife Conservation Commission) in the identification of exotic pest plants and has conducted invasive plant inventories of other public lands that are adjacent to district-managed lands.

III.G Noxious and Exotic Weeds Task Team (NEWTT)

The Noxious and Exotic Weeds Task Team is an issue team of the South Florida Ecosystem Restoration Task Force and Working Group. As such, SFWMD's involvement on NEWTT is one of the many ways Vegetation Management can have a direct influence on the future of Everglades restoration. In FY01, NEWTT published "Weeds Won't Wait – Part One." This document is an assessment of invasive exotic plants in Florida. Vegetation Management staff has played an active role on this team throughout the years and were directly involved in the creation of this publication.

III.H Okeechobee Gourd

Vegetation management staff over the past decade have monitored populations of the federally and state-listed as endangered Okeechobee gourd (*Cucurbita okeechobeensis*) in Lake Okeechobee. This member of the cucumber family (Cucurbitaceae) occurs only in Lake Okeechobee and the middle St. Johns River. Lake Okeechobee's southern islands constitute its principal population centers. It has survived in Lake Okeechobee despite destruction of its pond apple tree habitat, Lake Okeechobee's wide water level fluctuations, decades of farming of the lake's islands, and the disinterest of humans. In 2001, broad habitat areas for the plant were exposed due to the low water levels in Lake Okeechobee. This year, the gourd has sprung forth in great profusion. In FY01, Vegetation management staff monitored the status of the gourd in Lake Okeechobee as well as provided review and input to the species federal recovery plan, as published by the USFWS. For year 2002, plans include continued monitoring of gourd populations in Lake Okeechobee and indirectly supporting new investigations into the gourd's genetics and biology. Limited support is also planned for US Fish and Wildlife Service's tentative plans to improve gourd habitat in the lake in accordance with the species recovery plan.

III.I DEP Funding for Mechanical Harvesting Research

The first of its kind in the state, this project set out to evaluate various methods for mechanical removal of exotic woody vegetation. While herbicide control options and costs are well understood, mechanical removal methodologies have never been fully studied. The project site was a 336-acre area of land within the East Coast Buffer designated as Cells 17&18, which the District was required by Broward County to restore. DEP provided \$250,000 of funding for this exotic plant removal effort. This funding was achieved through a cooperative agreement between the District and DEP. Three different contractors conducted field trials of several different mechanical removal options concurrent with the total restoration program activities.

III.J STAN Team

At the District, Operations & Maintenance, Public Works, is developing standards and policies for implementing a Readiness and Standardization Program. A three to five member deployable evaluation team, which consists of highly trained and experienced professionals specializing in the operational and engineering aspects of each District facility, was created for each functional area. There are five (5) functional areas monitored by the STAN Teams: Canal/Levee, Electrical/Electronics, Pump Stations, Structures, and Vegetation Management. Each STAN team will conduct annual assessment visits to ensure the goals of the Readiness and Standardization Assessment are achieved. The STAN team is also responsible for reviewing and revising the Standard Operating Procedures manuals. During FY01, Vegetation Management Staff actively participated in the Canal/Levee and the Vegetation Management STAN teams.

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